## Joint Annual Meeting of the Swiss and Austrian Physical Society 2023



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Type: Talk

## [101] Modern theory of thermal transport in solids

Tuesday 5 September 2023 14:00 (30 minutes)

We explore the atomistic mechanisms of thermal transport in solids, extending established formulations and developing the computational framework to solve them. Starting from a density-matrix formalism, we show how the phonon Boltzmann equation is missing a tunneling term that becomes pivotal in disordered or defective materials. Thus, we derive a unified 'Wigner formulation' that comprehensively describes heat conduction in crystals, glasses, and intermediate cases such as thermoelectrics. Also, we show how in crystalline conductors the microscopic transport equations can be coarse grained into a set of viscous heat equations that describe both Fourier diffusion and heat hydrodynamics; thus, we employ these to rationalize pioneering experiments, and to devise strategies to amplify and control heat hydrodynamics.

## **Theoretical Work**

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